

Self Positioning Astragal Seal

by

VERNARD W. SANDERS

5

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

10

The present invention relates generally to astragal seals and more particularly to self positioning astragal seals.

BACKGROUND ART

15

Double entrance doorways are used in a large variety of residential homes and commercial buildings. Typically, an active door provides for day to day ingress and egress to and from the residential home or building, and an inactive door remains closed, except in instances when a width greater than or equal to the width of the active door and less than or equal to the width of the double entrance doorway is required, such as, for example, for delivery of furniture and/or equipment that cannot fit through the double entrance doorway. If large objects, such as furniture and/or equipment must pass through the double entrance doorway, both the normally inactive door and the

active door of the doorway are opened, to create a wide entrance way, through which the furniture and/or equipment may pass.

- Mating edges of the inactive door and the active door do not typically contact one another directly, but are separated by an astragal, the astragal being attached to the edge of an inactive leaf, the astragal extending the length of the inactive door, cushioning the closing of the active door and associated inactive leaf of the doorway, and sealing gaps between the inactive door and the active door.

- 10 The astragals often have upper and lower bolt-slide assemblies, which lock the astragals and the inactive doors to upper and lower portions of a door frame surrounding the double entrance door way. The upper and lower bolt-slide assemblies have bolts, which slide within upper and lower ends of the astragal, and are pushed outwardly from the inactive door to extend beyond the ends of the astragal, and are received by upper and
15 lower apertures in the upper and lower portions of the door frame, also known as the header and threshold sill, respectively, to lock the inactive door in place.

- Stationary seals are typically used at the lower end of the astragals for sealing and preventing drafts from entering the residential homes and/or commercial buildings
20 through the double entrance doorways at the threshold sill. Since many different types, sizes, and shapes of thresholds are used, the drafts remain an unwanted by product of using the stationary sills. In many instances, the fixed size of the seals, and the materials used, for the stationary seals, are either too thick or too thin to fill the gap

between the lower end of the astragal and the threshold sill, and, thus, result in not providing an adequate seal, and/or the seal degrading over time.

There is thus a need for a self positioning astragal seal that prevents unwanted drafts, is

- 5 easy to use and install in a quick, convenient, and efficient manner, is durable and long lasting, maintains its seal against drafts over time, even in situations where repeated opening and closing of the inactive door is necessary, and can be used with a variety of astragals and threshold sills, types, sizes, and shapes of threshold sills, doors, and door frames.

10

The self positioning astragal seal should be capable of automatically positioning at least one seal at the lower end of the astragal adjacent the threshold sill, and prevent drafts at the vicinity of the lower end of the astragal and the threshold sill, and/or of automatically positioning at least one seal at the upper end of the astragal adjacent the

- 15 header, and prevent drafts at the vicinity of the header.

The self positioning astragal seal should independently position itself abuttingly adjacent the sill and/or the header when the bolts are extended from a retracted position to an extended position and are received by the upper and/or lower apertures in the

- 20 upper and/or lower portions of the door frame.

Different astragals have heretofore been known. However, none of the astragals

adequately satisfies these aforementioned needs.

U.S. Patent No. 5,857,291 (Headrick) discloses an astragal with integral sealing lock block, for use with a double door installation, which includes an astragal strip secured along a vertical edge of an inactive door. A lock block is slidably disposed in at least one end of the astragal strip, and can be moved between an extended position, for securing the inactive door, and a retracted position for freeing the inactive door. The lock block has a projecting bolt receivable in a receptacle in a door frame, when the lock block is slid to its extended position. A gasket is secured to an end of the lock block, and the bolt passes through an opening in the gasket. The gasket engages and seals against the door frame, when the lock block is in its extended position. Gaskets are also provided on the sides of the lock block, for engaging and sealing against the doors of the double door installation. When the doors are closed and secured in place, the lock block and gasket assembly prevents drafts from flowing under the door installation beneath the astragal thereof.

15 U.S. Patent Nos. 5,350,207 and 5,328,217 (Sanders) disclose locking astragals, for attaching to an inactive leaf of a double doorway, and in particular U.S. Patent No. 5,350,207. Each of the locking astragals has an elongated astragal casing, which has a channel and bolt-slide assemblies mounted slidably within the channel. Each bolt-slide assembly includes a latching member and bolt. By depressing the latching member, the latching member can slide through the channel, to extend and lock the bolts into indentations in upper and lower

surfaces of a door frame. The bolts may also be retracted back into the astragal, to open the inactive leaf. Each of the latching members has an integral spring, which simplifies fabrication and assembly.

5 U.S. Patent No. 6,491,326 (Massey, et al) discloses a swing adaptable astragal with lockable unitary flush bolt assemblies, for double door entryways, which includes an extruded aluminum frame into which upper and lower flush bolt assemblies are slidably disposed. The flush bolt assemblies include a long metal bolt about which is injection overmolded a series of retainer guides, 10 which ride in the frame. Locking mechanisms are also integrally overmolded onto the bolts. The frame and all components of the astragal assembly are symmetrical and reversible, so that the assembly is non-handed; that is, it can be adapted to both a right hand swing and a left-hand swing inactive door. A strike plate mounting system and bottom-sealing block are provided, and the upper 15 end of the assembly includes means for sealing against a stop of a head jamb. Drafts at upper and lower inside corners of the doors of a double door entryway may be prevented.

U.S. Patent No. 6,125,584 (Sanders) discloses an automatic door bottom for a 20 hinged door, which is pivotable to be positioned over a sill when closed, the door having a hinge side and a width, the door bottom having an inverted channel having an open bottom, a length corresponding to the door width and a hinge end corresponding to the hinge side of the door; a sealing member having

a length corresponding to the length of the channel, the sealing member being housed in the channel and being movable vertically downwardly into a sealing position, in which the sealing member contacts the sill when the door is closed; and a displacement mechanism installed in the channel and coupled to the sealing member, for moving the sealing member vertically into the sealing position in response to closing of the door, wherein the displacement mechanism is coupled to the sealing member at a plurality of points along the length of the sealing member, and is operative to move the end of the sealing member at the hinge side of the channel into the sealing position, prior to the remainder of the sealing member, during closing of the door.

10

15

20

U.S. Patent No. 6,457,751 (Hartman) discloses a locking assembly for an astragal, which can be attached to an inactive door of a double door unit of a residence or a building. The astragal is attached to an edge of the inactive door in space between the inactive door and active door. A separate locking assembly is attached adjacent a top end of the door and also adjacent a bottom end of the door. A plug having an elongated locking bolt extending therefrom is mounted in a front end of a carriage member. Additional structure is provided for reciprocal travel of the carriage member between a locked position and an unlocked position.

U.S. Patent No. 5,335,450 (Procton) discloses an astragal, which has an exterior aluminum extrusion and an interior wooden portion. The exterior extrusion

includes a pair of rearwardly extending center walls, which form a channel for receiving the wooden interior portion. Attachments and door hardware can be installed in the wooden interior portion, while the extruded exterior acts as cladding.

5

U.S. Patent No. 5,590,919 (Germano) discloses a T-astragal and sleeve for door, for use with double swinging doors, such as for french doors. The T-astragal includes a cap portion perpendicular to a base portion, wherein both the cap and base can be formed from wood, such as plywood or plastic. The T-astragal is a molding that extends the full height of the swinging doors. One side of the base portion is fixably coupled to the free end of one of the swinging doors by nails or screws. The free end of the other swinging doors is able to swing up to and against a shoulder portion formed from the cap and base portions. A metal pipe shaped sleeve having an approximate length of one foot is partially positioned along the longitudinal axis of the T-astragal molding. A bolt slides within the sleeve from a rest position to an extended position, where the extended position locks the attached door to a matching slot in the door frame.

10
15

U.S. Patent No. 4,429,493 (St. Aubin) discloses an astragal housing seal and lock, for use in a double door assembly having an active door and a relatively inactive door. The astragal has a vertically extending mullion housing, which is attached to a free edge of the relatively inactive door. A vertically extending

slide section is mounted on the mullion housing on a sealing side of the free edge of the inactive door. The slide section extends from the free vertical edge of the inactive door, when the active door is in the closed position. The slide section is vertically movable from an unlocked position to a locked position,
5 wherein the slide section is moved vertically downward, with respect to the mullion housing, to engage the sill/threshold of the door frame, thereby preventing movement of the inactive door.

U.S. Patent No. 4,058,332 (DiFazio) discloses an astragal and flush bolt
10 assembly to be secured to a relatively stationary member such as a door jamb or to the edge of an inactive door of a pair of double doors or the like. The astragal assembly includes a flat metal body mounted on the edge of the stationary member and a metal stop member secured to the body along one edge thereof. The flat body includes first and second spaced apart legs extending
15 outwardly from the stationary member, with the flat body and legs defining a channel to receive and retain a door latch bolt from the active door. The stop member prevents movement of the door in a first direction, and when the latch bolt is engaged in the channel, the channel and latch bolt prevent the door from moving in the opposite direction. A pair of flush bolts are slidably
20 mounted in the channel, one adjacent each end thereof, so that when the astragal assembly is utilized with double doors, the flush bolts are moved to engage the header and sill, respectively, to hold the inactive door stationary. The astragal body is secured to the stop member by a thermal barrier or thermal break

structure, to provide thermal insulation between the inside and the outside of the doors. The stop member also includes a weather strip to form a seal against the active door, and when metal doors or metal covered doors are used, the weather strip may include a magnetic member to form a seal against the active door.

5

U.S. Patent No. 6,453,616 (Wright) discloses an astragal for use with exterior double door installations, such as french doors. When attached to the edge of a generally inactive door, the astragal provides a door stop for an active door, a seal to prevent intrusion of water, and a lock for the inactive door. The
10 invention particularly pertains to extruded metal astragals, capable of increasing the resistance of the double door system to high wind conditions. The astragal comprises a longitudinally extending base member that has at least one longitudinally extending channel and a pair of spaced apart outwardly extending legs. At least one bolt is slidably inserted in the channel adjacent to one of the first and second ends of the channel. The astragal is attached to the door, by at
15 least one cleat whose spaced apart arms engage the legs of the base member, providing resistance to the astragal rocking in relation to the door edge, when the doors are subject to wind forces.

20 U.S. Patent No. D293,719 discloses a combined astragal extrusion and seal.

For the foregoing reasons, there is a need for a self positioning astragal seal that prevents unwanted drafts, is easy to use and install in a quick, convenient, and efficient

manner, is durable and long lasting, maintains its seal against drafts over time, even in situations where repeated opening and closing of the inactive door is necessary, and can be used with a variety of astragals and threshold sills, types, sizes, and shapes of threshold sills, doors, and door frames. The self positioning astragal seal should be

5 capable of automatically positioning at least one seal at the lower end of the astragal adjacent the threshold sill, and prevent drafts at the vicinity of the lower end of the astragal and the threshold sill, and/or of automatically positioning at least one seal at the upper end of the astragal adjacent the header, and prevent drafts at the vicinity of the header. The self positioning astragal seal should independently position itself

10 abuttingly adjacent the sill and/or the header when the bolts are extended from a retracted position to an extended position and are received by the upper and/or lower apertures in the upper and/or lower portions of the door frame.

SUMMARY

The present invention is directed to a self positioning astragal seal that automatically positions at least one seal at the lower end of an astragal adjacent the threshold sill of a door frame, and prevent drafts at the vicinity of the lower end of the astragal and the threshold sill, and/or of automatically positions at least one seal at the upper end of the astragal adjacent the header of the door frame, and prevent drafts at the vicinity of the header. The self positioning astragal seal independently positions itself abuttingly adjacent the sill and/or the header when the astragal's bolts are extended from a retracted position to an extended position and are received by the upper and/or lower apertures in the upper and/or lower portions of the door frame. The self positioning astragal seal prevents unwanted drafts, is easy to use and install in a quick, convenient, and efficient manner, is durable and long lasting, maintains its seal against drafts over time, even in situations where repeated opening and closing of the inactive door is necessary, and can be used with a variety of astragals and threshold sills, types, sizes, and shapes of threshold sills, doors, and door frames.

A self positioning astragal seal, for use with an astragal having a bolt having a bolt retracted position and a bolt extended position, having features of the present invention comprises: a seal block having a catch and a hole, the bolt slidably disposed through the hole, the catch catching a portion of the bolt and holding the seal block in a seal block retracted position when the bolt is in the bolt retracted position and releasing the seal

block when the bolt is in the bolt extended position; spring means forcing the seal block into a seal block extended position when the seal block is released.

An astragal having a self positioning astragal seal having features of the present
5 invention comprises: an astragal body; a bolt having a bolt retracted position and a bolt
extended position; a seal block having a catch and a hole, the bolt slidably disposed
through the hole, the catch catching a portion of the bolt and holding the seal block in a
seal block retracted position when the bolt is in the bolt retracted position and releasing
the seal block when the bolt is in the bolt extended position; spring means forcing the
10 seal block into a seal block extended position when the seal block is released.

DRAWINGS

These and other features, aspects, and advantages of the present invention will become better understood with regard to the following description, appended claims, and
5 accompanying drawings where:

FIG. 1 is a perspective view of a self positioning astragal seal, constructed in accordance with the present invention, shown extended;

FIG. 2 is a perspective view of the self positioning astragal seal, shown retracted;

FIG. 3 is an exploded view of the self positioning astragal seal and a latching
10 mechanism;

FIG. 4 is an exploded view of selected components of the self positioning astragal seal and a portion of the latching mechanism of FIG. 3;

FIG. 5 is an exploded view of the latching mechanism of FIG. 3;

FIG. 6 is a perspective view of entrance doors, comprising an inactive door, shown
15 in a closed position, and an active door;

FIG. 7 is a perspective view of the inactive door, showing the self positioning astragal seal and an astragal installed thereon the inactive door, with the self positioning astragal seal extended;

FIG. 8 is a section view of the self positioning astragal seal, shown extended;

20 FIG. 9 is another section view of the self positioning astragal seal, shown extended;

FIG. 10 is another section view of the self positioning astragal seal, with the self positioning astragal seal extended;

FIG. 11 is another section view of the self positioning astragal seal, with the self positioning astragal seal extended;

FIG. 12 is another section view of the self positioning astragal seal, with the self positioning astragal seal extended;

5 FIG. 13 is another section view of the self positioning astragal seal, with the self positioning astragal seal extended;

FIG. 14 is another section view of the self positioning astragal seal, with the self positioning astragal seal extended;

FIG. 15 is a section view of the latching mechanism of FIG. 3, along a portion of

10 line 8-8 of FIG. 7, with the self positioning astragal seal extended;

FIG. 16 is a section view of the self positioning astragal seal, along a portion of line 8-8 of FIG. 7, with the self positioning astragal seal extended;

FIG. 17 is a section view of the self positioning astragal seal, shown retracted;

FIG. 18 is another section view of the self positioning astragal seal, shown retracted;

15 FIG. 19 is an exploded view of an upper bolt and latching mechanism of the astragal of FIG. 7.

FIG. 20 is a section view of the self positioning astragal seal shown with an alternate embodiment of an astragal installed thereon the inactive door;

FIG. 21 is a section view of the self positioning astragal seal shown with an alternate embodiment of an astragal installed thereon the inactive door;

20 FIG. 22 is a section view of the self positioning astragal seal shown with an alternate embodiment of an astragal installed thereon the inactive door, and also showing the active door;

FIG. 23 is a section view of the self positioning astragal seal shown with an alternate embodiment of an astragal installed thereon the inactive door, and also showing the active door;

FIG. 24 is a section view of the self positioning astragal seal shown with an alternate embodiment of an astragal installed thereon the inactive door, and also showing the active door; and

FIG. 25 is a section view of the self positioning astragal seal shown with an alternate embodiment of an astragal installed thereon the inactive door, and also showing the active door.

REFERENCE NUMERALS

These and other features, aspects, and advantages of the present invention will become better understood with regard to the references and associated reference numerals of the
5 following description and accompanying drawings where:

- 10** self positioning astragal seal
- 12** seal block
- 14** seal block hole
- 16** shoulder
- 10 **18** compression spring
- 20** end seal
- 30** astragal
- 42** inactive door edge
- 44** inactive door
- 15 **46** sill
- 48** door frame
- 52** elongated guide
- 54** elongated guide channel
- 56** lower bolt
- 20 **58** shoulder
- 60** astragal bottom
- 74** seal block bottom
- 78** seal block base

	80	face plate
	82	guide block
	84	"T" shaped member
	86	compression spring guide holder
5	88	compression spring bottom end
	90	base top
	92	barrel
	94	barrel extension
	96	barrel extension arcuate interior
10	98	extension
	100	extension arcuate interior
	102	T top portion
	104	arcuate interior
	105	angled edges
15	106	shoulder
	108	face plate reinforcement
	110	face plate stop
	112	guide block edge stop
	114	guide block reinforcement
20	116	guide block stop
	130	astragal recess
	132	astragal extension stop
	134	astragal retraction stop

	136	astragal opposing side
	138	astragal side portion
	140	astragal side
	142	side channel
5	144	threaded hole
	146	threaded hole
	148	set screw
	150	angled longitudinal channel edge
	152	compression spring top end
10	154	seal hole
	156	face seal
	158	face plate exterior side
	160	active door edge
	162	active door
15	164	header
	166	seal peel off adhesive strip
	168	face seal peel off adhesive strip
	180	astragal housing
	182	longitudinal channel
20	184	longitudinal retention guide
	185	channel base
	186	lockset strike
	188	deadbolt strike

	190	upper bolt
	191	upper bolt assembly
	192	lockset
	194	deadbolt
5	196	lockset cover plate
	198	deadbolt cover plate
	199	screws
	200	latching member
	202	pull block
10	204	elongated connector
	206	compression spring
	208	slide plate
	210	bolt lower portion
	212	bolt mid portion
15	214	bolt upper portion
	216	bolt slot
	218	bolt hole
	220	end pin
	222	elongated connector hole
20	224	pin
	226	pin
	228	pull block track
	230	pull block retention track

	232	pull block retention track
	234	pull block channel
	236	pull block channel
	238	pull block notch
5	240	pull block base
	242	pull block notch
	244	pull block bearing notch
	246	pull block notch side
	248	lever arm receiving hole
10	250	lever arm
	252	trunnion
	254	spring tail
	256	latching dog
	260	slide plate retraction hole
15	262	slide plate extension hole
	264	slide plate notch
	266	slide plate end tab
	268	slide plate projecting tab
	270	slide plate projecting notch
20	280	elongated guide notched recess
	282	elongated guide end
	284	pull block arrow marking
	286	arcuate side

	288	arcuate base
	300	alternate astragal housing
	302	saw tooth recess
	304	finned tail
5	306	foam weather strip
	308	cavity
	310	alternate astragal housing
	312	thermal break
	314	slot
10	320	alternate astragal
	322	alternate astragal housing
	324	cover
	326	outer seal
	328	inner seal
15	330	alternate astragal
	332	thermal break
	340	alternate astragal
	342	cover element
	344	saw tooth recess
20	346	finned tail
	348	weather strip seal
	349	inner seal
	350	alternate astragal

352 thermal break

DESCRIPTION

5 The preferred embodiments of the present invention will be described with reference to FIGS. 1-25 of the drawings. Identical elements in the various figures are identified with the same reference numbers.

FIGS. 1-19 show an embodiment of the present invention, a self positioning astragal seal 10, which comprises a seal block 12 having a substantially centrally disposed hole 14 therethrough, a shoulder 16, compression springs 18, and end seal 20, for use with an astragal 30.

The astragal 30 is mounted to edge 42 of inactive door 44, and the self positioning astragal seal 10 is mounted to the astragal 30 adjacent sill 46 of door frame 48, as shown in FIGS. 6 and 7. The astragal 30 has an elongated guide 52 having a substantially centrally disposed longitudinal channel 54 and a bolt 56 having a shoulder 58, the bolt 56 slidably mounted therein the substantially centrally disposed longitudinal channel 54.

20

The astragal seal shoulder 16 catches the bolt shoulder 58 when the bolt 56 is retracted to a retracted position, as shown in FIGS. 2, 17, and 18, and is released from the bolt shoulder 58 when the bolt 56 is extended to an extended position, as shown in FIGS. 1

and 7-16, the compression springs 18 forcing the seal block 12 into an extended position, when the bolt 56 is in the bolt extended position. The seal block 12 is, thus, retracted to a retracted position, the astragal seal shoulder 16 catching and abutting the bolt shoulder 58, and holding the seal block 12 in a seal block retracted position when 5 the bolt 56 is in the bolt retracted position. The seal block 12 is extended to the seal block extended position, when the astragal seal shoulder 16 is released from the bolt shoulder 58, the compression springs 18 forcing the seal block 12 into the seal block extended position, when the bolt 56 is in the bolt extended position. The astragal seal shoulder 16, thus, acts as a catch, which catches the bolt shoulder 58 when the bolt 56 is 10 retracted to the bolt retracted position, and is released from the bolt shoulder 58 when the bolt 56 is extended to the bolt extended position.

The self positioning astragal seal 10 automatically and independently adjusts itself to fit snugly and fill any gaps between bottom 60 of the astragal 30 and the sill 46 of the door frame 48, when the bolt 56 is in the bolt extended position, thus, preventing unwanted drafts between bottom 74 of the seal block 12 and the sill 46 of the door frame 48, the compression springs 18 forcing the seal block 12 opposingly away from the bottom 60 of the astragal 30 and forcing the end seal 20, which is affixed to the bottom 74 of the seal block 12, to abut the sill 46 of the door frame 48.

20

The seal block 12 has base 78, face plate 80, and guide block 82, which is adjacent the inactive door edge 42, when the self positioning astragal seal 10 and the astragal are installed on the inactive door 44 and the seal block 12 is in the retracted position, the

face plate 80 and the guide block 82 being substantially perpendicular to the base 78, and substantially parallel one to the other.

The seal block 12 has substantially "T" shaped member 84 integral with the guide block 82 and compression spring guide holders 86, which hold the compression springs 18 in place, the compression springs 18 being mounted about the compression spring holders 86, with bottom ends 88 of the compression springs 18 abutting top 90 of the base 78.

The seal block 12 has barrel 92 integral with the guide block 82, the barrel 92 having the substantially centrally disposed hole 14 therethrough to the bottom 74 of the seal block 12, the bolt 56 slidable therethrough the substantially centrally disposed hole 14, and the seal block 12 slidable about the bolt 56. The barrel 92 has extension 94, which is integral with the barrel 92, having arcuate interior 96, which is substantially collinear with the interior of the barrel 92, and extension 98 having the shoulder 16 and arcuate interior 100. The substantially "T" shaped member 84 has T top portion 102, which has arcuate interior 104, angled edges 105, and shoulder 106. The face plate 80 has reinforcements 108 having stops 110. The guide block 82 has edge stops 112 and reinforcements 114 having stops 116. The compression spring holders 86 have splines for reinforcement.

20 The elongated guide 52 of the astragal 30 has recesses 130, which have extension stops 132 and retraction stops 134 at opposing ends thereof, and substantially planar opposing side 136. The elongated guide 52 of the astragal 30 has substantially planar side portions 138 adjacent the recesses 130, which oppose the substantially planar opposing

side **136**, and sides **140**, which are substantially perpendicular to the substantially planar side portions **138**, the recesses **130**, and the substantially planar opposing side **136**. The elongated guide **52** also has opposing longitudinally disposed side channels **142**. The substantially planar side portions **138** and the substantially planar opposing side **136**
5 have threaded holes **144** and **146**, respectively, therethrough, opposing one another, having set screws **148** therein, the set screws **148** extending across the longitudinally disposed side channels **142**. The elongated guide **52** also has angled longitudinal edges **150** atop the substantially centrally disposed longitudinal channel **54** adjacent the recesses **130** and the substantially planar side portions **138**.

10

The substantially "T" shaped member **84** and the face plate **80** of the seal block **12** matingly sandwich the recesses **130** and the substantially planar opposing side **136** of the astragal **30**, respectively, therebetween, and retain the seal block **12** slidably mating about the elongated guide **52** between the seal block retracted position and the seal
15 block extended position, and vice versa.

The compression springs **18** are mounted about the compression spring holders **86**, with the bottom ends **88** of the compression springs **18** abutting the top **90** of the base **78** of the seal block **12** and top **152** of the compression springs **18** abutting the set screws **148**
20 in the longitudinally disposed side channels **142** of the astragal **30**. The compression springs **18** are held in the longitudinally disposed side channels **142** of the astragal **30** under compression, the extension stops **132** of the astragal **30** preventing the

compression springs **18** from forcing the substantially "T" shaped member **84** out of the recesses **130**.

The barrel **92** of the seal block **12** is matingly slidable about the bolt **56** of the astragal **30**, and the bolt **56** is matingly slid able therethrough the substantially centrally disposed hole **14** of the barrel **92** of the seal block **12**. The angled edges **105** of the substantially "T" shaped member **84** matingly abut the angled longitudinal edges **150** of the astragal **30**. The angled edges **105** of the substantially "T" shaped member **84** and the barrel **92** of the guide block **82** guide the seal block **12** collinearly with the angled longitudinal edges **150** of the astragal **30** and the substantially centrally disposed longitudinal channel **54**, the bolt **56** being substantially aligned with the substantially centrally disposed longitudinal channel **54**.

The extension stops **132** and the retraction stops **134** limit the extent of travel of the substantially "T" shaped member **84**, and, thus, limit the extent of travel of the seal block **12** and the end seal **20** from the seal block extended position to the seal block retracted position, respectively, the compression springs **18** forcing the seal block **12** into the extended position, other than when the seal block **12** is retracted. The seal block **12** is retracted to the retracted position, the astragal seal shoulder **16** catching and abutting the bolt shoulder **58**, and holding the seal block **12** in the seal block retracted position, when the bolt **56** is in the bolt retracted position. The seal block **12** is extended to the seal block extended position, when the astragal seal shoulder **16** is

released from the bolt shoulder **58**, the compression springs **18** forcing the seal block **12** into the seal block extended position, when the bolt **56** is in the bolt extended position.

The end seal **20** has substantially centrally disposed hole **154** therethrough, which is
5 substantially aligned collinearly with the substantially centrally disposed hole **14** of the seal block **12**, which allows the end seal **20** to slide about the bolt **56**, and vice versa.

The self positioning astragal seal **10** has face seal **156**, which is affixed to exterior side **158** of the face plate **78** of the seal block **20** and abuts edge **160** of active door **162**, when the active door **162** is closed abuttingly against the inactive door **44**, thus,
10 preventing unwanted drafts between the self positioning astragal seal **10** and the edge **160** of the active door **162**. The astragal **30** also has edge seal **163**.

The self positioning astragal seal **10** may be used with the astragal **30** adjacent the sill **46** and/or header **164** of the door frame **48**, and may be used with the inactive door **44**
15 and/or the active door **162**. Typical installations, however, have the astragal **30** mounted to the edge **42** of the inactive door **44**, and the self positioning position astragal end seal **20** mounted to the astragal **30** adjacent the sill **46**.

The self positioning astragal seal **10** may be used with a variety of astragals but is
20 preferably used with the astragal **30** shown in the accompanying figures. Other astragals may be modified to suit the needs of particular applications.

The end seal **20** and the face seal **156** may have adhesives covered by peel off adhesive strips **166** and **168**, respectively, the end seal **20** and the face seal **156** being fastened to the seal block **12** with the adhesives, upon removal of the adhesive strips **166** and **168**, respectively.

5

The astragal **30** has astragal housing **180** having longitudinal channel **182**, which has longitudinal retention guides **184**, the elongated guide **52** inserted into the longitudinal channel **182** and held in the longitudinal channel **182** by the retention guides **184** and the set screws **148**, and channel base **185**, the set screws **148** locking the elongated guide **52** into the astragal housing **180**. The astragal **30** also has lockset strike **186**, deadbolt strike **188**, and upper bolt **190** mounted to the longitudinal channel **182** of the astragal housing **180**, the bolt **56** and the upper bolt **190** being used to lock the astragal **30**, and, thus, the inactive door **44**, which the astragal **30** is affixed to, to the sill **46** and the header **164**, respectively, of the door frame **48**. The upper bolt **190** may be used with the self positioning astragal seal **10** and/or alternatively the upper bolt **190** may use an alternative sealing means. Upper bolt assembly **191** having the upper bolt **190** is installed into the longitudinal channel **182** in substantially the same manner as the elongated guide **52**. The active door **162** has lockset **192** and deadbolt **194**, which are received by lockset strike **186**, deadbolt strike **188**, respectively, on the inactive door **44**, for securing the active door **162** to the inactive door **134** when the active door **162** is closed abuttingly adjacent the inactive door **44**. The astragal housing **180** has lockset cover plate **196** and deadbolt cover plate **198**, which are mounted to the astragal

housing 180, the lockset strike 186 and the deadbolt strike 188 being fastened to the lockset cover plate 196 and the deadbolt cover plate 198 with screws 199.

The astragal 30 has latching member 200, pull block 202, elongated connector 204, 5 compression spring 206 about the elongated connector 204, and slide plate 208. The bolt 56 has lower portion 210, mid portion 212 adjacent the shoulder 58, the mid portion 212 having a smaller diameter than the diameter of the lower portion 210, and upper portion 214, the upper portion 214 of the bolt 56 having substantially the same diameter as the lower portion 210, and having a slot 216 therethrough and a hole 218 10 therethrough, the slot 216 and the hole 218 substantially perpendicular one to the other.

The elongated connector 204 has end pin 220, opposing hole 222, and pin 224 therebetween, the end pin 220 and the pin 224 substantially perpendicular to the plane of the elongated connector 204. The elongated connector 204 is sandwiched in the slot 15 216 of the upper portion 214 of the bolt 56, the hole 218 and the hole 222 aligned one with the other, the bolt 56 and the elongated connector 204 pinned one to the other with pin 226, the pin 226 therethrough the holes 222 and 218.

The pull block 202 has longitudinal tracks 228, retention tracks 230 and 232, and 20 channels 234 and 236, the channels 234 between the longitudinal tracks 228 and the retention tracks 230, and the channels 236 between the longitudinal tracks 230 and the retention tracks 232. The pull block 202 is inserted into the longitudinal channel 182 of the astragal housing 180, the channels 234 and 236 being adjacent to the retention

guides 184 of the astragal housing 180, the retention guides 184 slidably retaining the pull block 204 in the astragal housing 180. The pull block 202 has substantially centrally disposed notch 238 at base 240 of the pull block 202, notch 242 adjacent and substantially perpendicular to the substantially centrally disposed notch 238, and

5 bearing notches 244. The substantially centrally disposed notch 238 is adjacent to and surrounds the elongated connector 204 adjacent the end pin 220 of the elongated connector 204; and sides 246 of the notch 242 surround and abut the end pin 220, thus, pinning the elongated connector 204 to the pull block 202 one to the other. The pull block 202 also has lever arm receiving hole 248.

10

The latching member 200 has lever arm 250, which has trunnions 252 protruding therefrom, spring tail 254, and latching dog 256.

15 The slide plate 208 has retraction hole 260, extension hole 262, notches 264, which form end tabs 266, and projecting tabs 268, which form projecting notch 270 therebetween, the projecting notch 270 for matingly slidably receiving the elongated connector 204 therebetween.

20 The elongated guide 52 is locked into the astragal housing 180 with the set screws 148. The elongated guide 52 has notched recesses 280 opposing the recesses 130, the notched recesses 280 matingly receiving the end tabs 266 of the slide plate 208 therein, and adjacent ends 282, the notches 264 of the slide plate 208 matingly receiving the ends 282 of the elongated guide 52 therein, the slide plate 208 being sandwiched and

locked between the elongated guide 52 and the channel base 185 of the astragal housing 180. The projecting notch 270 of the slide plate 208 slidably guides the elongated connector 204, which is located in the projecting notch 270, substantially collinear with the center line of the elongated guide 52.

5

The latching member 200 is sandwiched between the pull block 202 and the slide plate 208, with the trunnions 252 in the bearing notches 244 of the pull block 202 and the lever arm 250 extending through the lever arm receiving hole 248 of the pull block 202, thus facilitating operator control.

10

The retraction hole 260 and the extension hole 262 of the latching member 200 matingly receive the latching dog 256 of the latching member 200 therein.

The latching member 200 may be retracted to a latching member retracted position, 15 when the lever arm 250 of the pull block 202 is depressed and pushed in the direction of pull block arrow marking 284, which pulls the elongated connector 204 in the direction of the pull block arrow marking 284, pulls the bolt 56 into the bolt retracted position, pulls the seal block 12 into the seal block retracted position, compresses the compression springs 18, and compresses the compression spring 206 between the pin 20 224 of the elongated connector 204 and the projecting tabs 268 of the slide plate 208.

When the latching member 200 is retracted to the latching member retracted position, the spring tail 254 of the latching member 200 forces the latching dog 256 into the

retraction hole **260** of the slide plate **208**, thus, locking the bolt **56** into the bolt retracted position and locking the seal block **12** into the seal block retracted position.

The latching member **200** may be released into a latching member extended position
5 from the latching member retracted position, when the lever arm **250** of the pull block **202** is depressed and released, releasing compression from the compression spring **206** between the pin **224** of the elongated connector **204** and the projecting tabs **268** of the slide plate **208**, forcing the elongated connector **204** in the direction opposing the pull block arrow marking **284**, forcing the bolt **56** into the bolt extended position, releasing
10 compression on the compression springs **18**, which forces the seal block **12** into the seal block extended position. When the latching member **200** is released, the latching member **200** snaps into latching member extended position, the latching dog **256** snaps into the extension hole **262** of the slide plate **208**, the spring tail **254** of the latching member **200** forcing the latching dog **256** into the extension hole **262**, thus, locking the
15 bolt **56** into the bolt extended position with the seal block **12** in the seal block extended position, the seal block **12** automatically and independently self positioned with the end seal **20** abutting the sill **46** of the door frame **48**. The latching member **200** may alternatively be pushed into the latch member extended position.

20 The substantially centrally disposed longitudinal channel **54** of the elongated guide **52** has arcuate sides **286** and arcuate base **288** to slidably and matingly accommodate the bolt **56**, the lower portion **210** and the mid portion **212** of which are substantially cylindrical and have substantially the same diameter. The mid portion **212** of the bolt

56 is also substantially cylindrical, but has a smaller diameter than the diameter than that of the lower portion **210** and the upper portion **214**.

The astragal housing **180** and the elongated guide **52** are preferably of metal, such as

- 5 aluminum or steel, thermoplastics, thermosetting polymers, rubber, or other suitable material or combination thereof.

The seal block **12** and the latching member **200** are preferably injection molded from an

engineered plastic resin that has properties to provide flexural strength, such as an

- 10 acetal, although other suitable materials may be used. The end seal **20** and the face seal **156** are preferably of cellular material, such as closed cell neoprene sponge, although other suitable materials may be used.

FIG. 15 shows the latching member **200** with the lever arm **250** depressed and the

- 15 latching dog **256** ready to be moved to the retraction hole **260** of the slide plate **208**, which is shown after being moved in FIGS. 17 and 18. The seal block **12** is also retracted along with the bolt **56**, when the latching dog **256** is moved into the retraction hole **260**, as shown in FIGS. 17 and 18.

- 20 The active door **162** and the inactive door **44** are "handed" as either right hand, in which the hinges of the active door **162** are on the right side of the active door **162** as viewed from the outside of the door frame **48** and left hand if the hinges of the active door **162** are on the left side of the door frame **48** as viewed from the outside of the door frame

48. The elongated guide 52 and the self positioning astragal seal 10 may easily be reversed from left hand to right hand, and vice versa, by merely loosening the set screws 148, removing the elongated guide 52 with the self positioning astragal seal 10 from the longitudinal channel 182 of the astragal housing 180, and installing the 5 elongated guide 52 with the self positioning astragal seal 10 on the end of the astragal housing 180 opposing that from which it was removed, thus, converting the astragal 30 from one hand to the other.

FIGS. 20-25 show alternate embodiments of astragals having astragal housings that the 10 self positioning astragal 10 may be used with, although other suitable astragals having other suitable astragal housings may be used.

FIG. 20 shows an alternate embodiment of an astragal housing 300, which has a saw-tooth recess 302 to retain finned tail 304 of a typical wrapped foam type weather strip 15 306 for sealing. The astragal housing 300 also has cavity 308.

FIG. 21 shows an alternate embodiment of an astragal housing 310, which is substantially the same as the astragal housing 300, except that the astragal housing 310 has thermal break 312, for installations in climates that experience extremely cold 20 weather, in which the astragal housing 310 is fabricated from an aluminum extrusion, or other suitable material having substantially the same properties, which would otherwise readily lose heat to the outside and result in condensation, and in some cases even the formation of ice. The thermal break 312 is created by filling cavity 308 of the astragal

housing 300 with a polyurethane thermal break compound, after which it is de-bridged by milling slot 314, thus, separating outer and inner portions of the astragal housing 310 and preventing infiltration of the cold.

5 FIG. 22 shows an alternate embodiment of an astragal 320, which may be used for installation on a pair of outswinging rather than inswinging doors, which has astragal housing 322, cover 324 that provides overlap, and outer seal 326, and is used on the active leaf of the pair of out swinging doors. Inner seal 328 is of greater reach as the beveled edge of the active door is reversed, creating a greater gap at its inner edge.

10

FIGS. 23 shows an alternate embodiment of an astragal 330, which may be used for installation on a pair of outswinging rather than inswinging doors, which is substantially the same as the astragal housing 320, except that the astragal 330 has thermal break 332.

15

FIG. 24 shows an alternate embodiment of an astragal 340, which may be used for installation on a pair of outswinging rather than inswinging doors, in which cover element 342 has saw-tooth recess 344 to accommodate finned tail 346 of a wrapped foam weather strip seal 348. Inner seal 349 is of greater reach as the beveled edge of
20 the active door is reversed, creating a greater gap at the inner edge.

FIGS. 25 shows an alternate embodiment of an astragal 350, which may be used for installation on a pair of outswinging rather than inswinging doors, which is

substantially the same as the astragal housing **340**, except that the astragal **350** has thermal break **352**.

Although the present invention has been described in considerable detail with reference
5 to certain preferred versions thereof, other versions are possible. Therefore, the spirit
and scope of the appended claims should not be limited to the description of the
preferred versions contained herein.